

## Trigonometric Identities

**\*\*Be sure to state any restrictions on the variable\*\***

**1. Verify each identity.**

- a.  $\cos x \csc x = \cot x$
- b.  $\sin x \cos x \cot x = \cos^2 x$
- c.  $\tan^2 x \cos^2 x = \sin^2 x$
- d.  $\csc x \tan x \cos x = 1$
- e.  $4\cot^2 x \sin x \tan x = 4\cos x$
- f.  $3\sin x \sec x \tan x = 3\tan^2 x$

**2. Show that each equation is an identity.**

- a.  $\csc x (\sin x + \cos x) = 1 + \cot x$
- b.  $(1 + \cos x)(1 - \cos x) = \sin^2 x$
- c.  $\sin x (\sin x + \csc x \cos^2 x) = 1$
- d.  $\tan x (\sin x + \cot x \cos x) = \sec x$
- e.  $(\sin x - \cos x)^2 + (\sin x + \cos x)^2 = 2$

**3. Prove.**

- a.  $\sin x - \cos^2 x \sin x = \sin^3 x$
- b.  $\tan x \sin^2 x + \tan x \cos^2 x = \tan x$
- c.  $\sec x \csc^2 x - \sec x = \sec x \cot^2 x$
- d.  $\tan^3 x \sec^2 x - \tan^3 x = \tan^5 x$

**4. Verify the following statements.**

- a.  $2\cos x + 2\tan^2 x \cos x = 2\sec x$
- b.  $\tan^2 x - \sin^2 x \tan^2 x = \sin^2 x$
- c.  $\tan x \csc x^2 - \tan x = \cos x \csc x$

**5. Prove.**

- a.  $\frac{1}{\sin \theta} - \sin \theta = \cos^2 \theta \csc \theta$
- b.  $\frac{\sec x}{\sin x} - \frac{\sin x}{\cos x} = \cot x$
- c.  $\csc x \cos^2 x + \sin x = \csc x$

**6. Transform one side of the equation to be sure it is equivalent to the other side of the equation.**

- $\sin^2\beta \sec\beta \csc\beta = \tan\beta$
- $\sin x(\csc x - \sin x) = \cos^2 x$
- $\tan x + \tan^3 x = \tan x \sec^2 x$
- $\csc x \cot x \cos x = \cot^2 x$
- $(1 + \cot x)(1 + \cot x) = \csc^2 x + 2\cot x$
- $\sin^3 x + \sin x \cos^2 x = \sin x$
- $\sin x \csc x - \tan^2 x \cos^2 x = \cos^2 x$
- $\cot x(\tan x + \cot x) = \csc^2 x$

**7. Prove that each equation is an identity.**

- $\frac{1}{\tan x} + \tan x = \sec^2 x \cot x$
- $\cot x - \sin^2 x \cot x = \cos^3 x \csc x$
- $\frac{\sin x}{1 - \cos x} = \frac{1 + \cos x}{\sin x}$
- $\tan \phi + \cot \phi = \sec \phi \csc \phi$
- $\frac{\cot x}{\csc x + 1} = \tan x \csc x - \tan x$

**8. Prove that each equation is an identity.**

- $\frac{1}{1 + \cos x} = \csc^2 x - \csc x \cot x$
- $\frac{\cos x}{\sec x - 1} - \frac{\cos x}{\tan^2 x} = \cot^2 x$
- $\frac{3\sin x}{1 - \cos x} = 3\csc x + 3\cot x$

**9. Solve for all possible values of x.**

- |   |                                  |
|---|----------------------------------|
| a. $\sin x = -\frac{\sqrt{2}}{2}$       | f. $\tan x \cos x = 0.7$         |
| b. $\cot x \sin x = \frac{\sqrt{3}}{2}$ | g. $3\sec x - 4 = 0$             |
| c. $\sec x = 2$                         | h. $\sin x \csc x + \cos x = 0$  |
| d. $\csc x + 1 = 0$                     | i. $2\sin x - \cos x \sec x = 0$ |
| e. $\cos x = 0.42$                      | j. $4\sec x + 5 = 0$             |

